REMARKS

Claims 5-7, 15-19, 23, 29-31 and 35-46 are pending in this application, with claims 5, 6, 15, 16, 35, 36, 39 and 40 being independent. Claims 1-4, 8-14, 20-22, 24-28 and 32-34 were previously cancelled and claims 15 and 16 have been amended to recite that the element capable of promoting crystallization of silicon is introduced after forming the second amorphous semiconductor film, as shown in the application at, for example pages 25 and 26. No new matter has been introduced.

Independent claims 15 and 16 have been rejected as being anticipated by Noguchi et al. (JP 04-168769); and independent claims 15 and 16, and their dependent claims 17 and 29, have been rejected as being unpatentable over Shimizu (U.S. Patent No. 5,753,541) in view of Noguchi and over Noguchi in view of Shimizu. Claims 15 and 16 have been amended to obviate these rejections.

Claims 15 and 16, as amended, recite a method of manufacturing a semiconductor device including "forming a first amorphous semiconductor film ... ," "forming a second amorphous semiconductor film including silicon on the first amorphous semiconductor film," and "introducing an element capable of promoting crystallization of silicon into the first amorphous semiconductor film or the second amorphous semiconductor film *after forming the second amorphous semiconductor film*" (emphasis added). Applicants request reconsideration and withdrawal of the rejection of claims 15 and 16 because neither Noguchi, Shimizu, nor any proper combination of the two describes or suggests introducing the recited crystallization promoting element after forming the second amorphous semiconductor film.

Noguchi describes a method of manufacturing a photovoltaic element that includes forming a multi-layer structure by first forming an amorphous SiGe or amorphous Ge layer 2, which the Office Action equates to the recited first amorphous semiconductor film, on a substrate 1 and then forming an amorphous Si layer 3, which the Office Action equates to the recited second amorphous semiconductor film. Noguchi, however, does not describe or suggest introducing an element capable of promoting crystallization of silicon into layer 2 or layer 3 after layer 3 is formed. Rather, Noguchi describes that a crystallization heating step takes place after

the multi-layer structure is formed to crystallize layers 2 and 3 into polycrystalline layers 21 and 31.

Shimizu describes a method of manufacturing a thin field effect transistor. Shimizu also does not describe or suggest introduction of an element capable of promoting crystallization of silicon after forming the recited second amorphous semiconductor film.

For at least these reasons, applicants request that the rejections of claims 15 and 16, and their dependent claims 17 and 29, be withdrawn.

Independent claims 5, 6, 35, 36, 39 and 40, along with their dependent claims 7, 23, 37, 38, and 41, have been rejected as being unpatentable over Noguchi in view of Shimizu and over Shimizu in view of Noguchi. Applicants traverse these rejections.

Independent claims 5, 6, 35, 36, 39 and 40 recite methods of manufacturing a semiconductor device including "forming a first amorphous semiconductor film comprising silicon and germanium on the insulating surface/film wherein *a concentration of the germanium is within a range of 0.1 atom% to 10 atom%*" (emphasis added). Applicants request reconsideration and withdrawal of the rejection of claims 5, 6, 35, 36, 39, and 40, and their dependent claims, because neither Shimizu, Noguchi, nor any proper combination of the two describes or suggests forming the recited film having silicon and germanium wherein the concentration of the germanium is within a range of 0.1 atom% to 10 atom%.

The Office Action admits that Noguchi does not teach the film containing the recited concentration of germanium but asserts that:

> Concentration is well known in the art to be a result effective variable and Noguchi et al teaches the concentration of germanium is a result effective variable, as evidenced in Figure 2. A lower germanium concentration would be desirable to limit the amount of impurities, which can diffuse through the device during high temperature processes. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Noguchi et al by optimizing the concentration of germanium to obtain the claimed range by conducting routine experimentation of a result effective variable.

Office Action p.3. While Noguchi does show in Fig. 2 a relationship between an amount of Ge in a SiGe layer and solid growth temperature, Noguchi explicitly teaches away from using a germanium concentration within the range 0.1 atom% and 10 atom%. In particular, as shown in the full translation submitted in the IDS of November 22, 2004, Noguchi states that conventional methods of forming polycrystalline silicon from amorphous silicon on a substrate require a solid

growth temperature of 500°C or more. According to Naguchi, such a high temperature is problematic because it makes the use of low cost glass substrates difficult. See Noguchi Translation, page 2, lines 15-18. Noguchi solves this problem by introducing germanium into the amorphous silicon to lower the solid growth temperature to below 500°C. Accordingly, Noguchi does not contemplate and, in fact, teaches away from using the recited low germanium concentration since, as shown in Fig. 2, such a concentration would result in a solid growth temperature well above 500°C, rendering use of a glass substrate once again problematic. On the contrary, Noguchi's focus is clearly on using high concentrations of Germanium of around 80 atom% or more to decrease the solid growth temperature to 400°C or less. See Noguchi Translation, page 3, lines 6-11 and page 4, lines 5-8 and 13-22. Accordingly, Noguchi does not describe or suggest forming the recited film having silicon and germanium wherein the concentration of the germanium is within the relatively low range of 0.1 atom% to 10 atom%.

As stated in the Office Action response mailed on November 22, 2004, Shimizu does not contemplate forming a "silicon and germanium" film. Shimizu only contemplates forming a germanium layer 6a on an amorphous silicon layer 5a. See Fig. 1, col. 5, lines 18-32. Accordingly, Shimizu does not describe or suggest forming the recited silicon and germanium film.

Moreover, one skilled in the art would not be motivated to combine Shimizu with Noguchi because Shimizu explicitly teaches away from using Noguchi's Si on high concentration Ge structure for construction of thin film transistors. Shimizu states that such a structure is problematic because it results in a low resistance layer between the transistor's source and drain electrodes that increases leakage current. If the thickness of the Ge layer is decreased to decrease the leakage current problem, the transistor performance suffers because of a reduction in carrier mobility, and a decrease in the uniformity of transistor characteristics. See col. 2, lines 36-50. Therefore, a skilled artisan, having reviewed Shimizu and Noguchi, would certainly not be led to combine the teachings of Shimizu and Noguchi.

For at least these reasons, applicants request reconsideration and withdrawal of the rejection of claims 5, 6, 35, 36, 39, and 40, along with their dependent claims 7, 23, 37, 38, and 41.

Claims 19, 31, 43 and 46, which depend from claims 15, 16, 39 and 40, have been rejected as being unpatentable over Shimizu in view of Noguchi and further in view of Zhang (U.S. Patent No. 5,578,520) or Noguchi in view of Shimizu and further in view of Zhang. Zhang does not remedy the failure of Shimizu and Noguchi to describe or suggest the subject matter of claims 15, 16, 39 and 40. Accordingly, applicants request reconsideration and withdrawal of the rejection of claims 19, 31, 43 and 46.

Claims 18, 30, 42 and 45, which depend from claims 15, 16, 39 and 40, have been rejected as being unpatentable over Shimizu in view of Noguchi and further in view of Maekawa (U.S. Patent No. 6,066,547) or Noguchi in view of Shimizu and further in view of Maekawa. Maekawa does not remedy the failure of Shimizu and Noguchi to describe or suggest the subject matter of claims 15, 16, 39 and 40. Accordingly, applicants request reconsideration and withdrawal of the rejection of claims 18, 30, 42 and 45.

Independent claims 5, 6, 15, 16, 35, 36, 39 and 40, along with their dependent claims 7, 19, 31, 37, 38 and 41, have been rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 7, 50, 51, 59, 60, and 66 of U.S. Patent No. 6,482,684 ("the '684 patent").

The Office Action acknowledges that claims 1, 7, 50, 51, 59, 60, and 66 of the '684 patent do not recite the limitation "forming a first amorphous semiconductor film comprising silicon and germanium on the insulating surface/film wherein *a concentration of the germanium is within a range of 0.1 atom% to 10 atom%*" (emphasis added), as recited in claims 5, 6, 15, 16, 35, 36, 39, and 40. The Office Action, however, asserts that the teachings of Noguchi render this limitation obvious. For at least the reasons described above in reference to claims 5, 6, 35, 36, 39 and 40, Noguchi does not describe or suggest forming an amorphous semiconductor film with the recited low concentration range of germanium. On the contrary, Noguchi teaches away from forming such a film. Accordingly, claims 5, 6, 15, 16, 35, 36, 39 and 40 would not have been

obvious over claims 1, 7, 50, 51, 59, 60, 66 of the '684 patent in view of Noguchi, and, therefore, applicants request reconsideration and withdrawal of the obviousness-type double patenting rejection of claims 5, 6, 15, 16, 35, 36, 39 and 40, and their dependent claims 7, 19, 31, 37, 38 and 41,

Applicants submit that all claims are in condition for allowance.

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Respectfully submitted,

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